

REMARKS

The present application was filed on December 17, 2001 with claims 1-25. In the outstanding Office Action dated September 21, 2005, the Examiner has: (i) rejected claims 2, 10, 15 and 17 under 1-21 under 35 U.S.C. §112, second paragraph, as being indefinite; (ii) rejected claims 1-11 and 15-25 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,934,471 to Carvey et al. (hereinafter "Carvey"), in view of U.S. Patent No. 5,159,595 to Flanagan et al. (hereinafter "Flanagan"); (iii) rejected claim 12 under §103(a) as being unpatentable over Carvey in view of Flanagan, and further in view of a paper by S.Q. Zheng et al., entitled "A Systolic Architecture for Sorting an Arbitrary Number of Elements," *Algorithms and Architectures for Parallel Processing, ICAPP 97, 3rd International Conference*, pp. 113-126 (Dec. 1997) (hereinafter "Zheng"); (iv) rejected claim 14 under §103(a) as being unpatentable over Carvey in view of Flanagan, and further in view of a paper by J.D. Carpinelli et al., entitled "Applications of Edge-Coloring Algorithms to Routing in Parallel Computers," *Proceedings of the Third International Conference on Supercomputing*, Vol. III, pp. 249-257 (May 1988) (hereinafter "Carpinelli"); and (v) indicated that claim 13 is allowable.

In this response, Applicant traverses the §112 and §103 rejections. Applicant respectfully requests reconsideration of the present application in view of the following remarks.

Claims 2, 10, 15 and 17 stand rejected under §112, second paragraph, as being indefinite. Specifically, the Examiner contends that the term "substantially" recited in the subject claims renders the claims indefinite (Office Action; page 2, paragraph 2). Applicant respectfully disagrees with this contention and asserts that it is well-settled law that the use of the word "substantially" in a claim does not inevitably introduce fatal ambiguity into the claim. Rather, "words of degree are entirely appropriate 'when serving reasonably to describe the claimed subject matter to those of skill in the field of invention, and to distinguish the claimed subject matter from the prior art.'" *Chemical Separation Technology Inc. v. United States*, 63 USPQ2d 11 1114, 1130 (Fed. Cl. 2002) (citing *Andrew Corp. v. Gabriel Electronics, Inc.*, 847 F.2d 819, 821 (Fed. Cir. 1988)). "[T]he term 'substantially' in patent claims gives rise to some definitional leeway . . . Patentees may use these terms to avoid unduly limiting the modified word. Thus the term 'substantially' may prevent

avoidance of infringement by minor changes that do not affect the results sought and accomplished.” *C.E. Equipment Co., Inc. v. United States*, 17 Cl.Ct. 293, 299 [13 USPQ2d 1363] (1989).

The present specification does not assign any special meaning to the term “substantially,” and, as such, the phrase “substantially” as used in the context of the subject claims simply means that the one or more data samples are routed in a manner which is as nearly conflict-free as possible. This is described in the present specification, for example, on page 15, lines 19-22. Accordingly, since the use of the term “substantially” in the subject claims is not believed to render the claims indefinite to those skilled in the art, Applicant respectfully requests withdrawal of the § 112 rejection of claims 2, 10, 15 and 17.

Claims 1-11 and 15-25 stand rejected under § 103(a) as being unpatentable over Carvey in view of Flanagan. With regard to independent claims 1, 9, 16 and 23, which are of similar scope, the Examiner contends that Carvey discloses all of the elements set forth in the subject claims, but acknowledges that “Carvey et al. does not explicitly teach a controller coupled to the receiver and transmitter where the controller is configured to route packets to an output of the cross-connect switch or an adjacent or [sic] node in the mesh architecture” (Office Action; page 3, paragraph 2). However, the Examiner further contends that Flanagan discloses such a feature (Office Action; page 3, paragraph 3). Applicant respectfully disagrees with the Examiner’s contentions.

Claims 1, 9, 16 and 23 are clearly distinguishable from the prior art of record, when considered either individually or in combination. Specifically, not only does Carvey fail to disclose a controller, as acknowledged by the Examiner, but Carvey also fails to teach or suggest both an input TSI and an output TSI in the same synchronous cross-connect switch, as explicitly recited in claim 1. In this regard, the Examiner contends that the input TSI and the output TSI set forth in claim 1 is analogous to the TSI (111) shown in FIGS. 2 and 3 of Carvey. Applicant respectfully disagrees with this contention.

The present invention, as set forth in claims 1, 16 and 23, requires an input TSI “operatively coupled to at least a first half-duplex link and to the receiver, the input TSI being configurable to selectively reorder one or more data samples received by the receiver,” and an output an TSI “operatively coupled to at least a second half-duplex link and to the transmitter, the output TSI being configurable to selectively reorder one or more data samples to be transmitted by the transmitter.”

As explained in the present specification, the input TSI reorders samples so that all samples that are matched are inserted into the same time-slot, while the output TSI is responsible for making sure samples are transmitted during the correct output time-slot. In a similar manner, claim 9 recites a method for routing one or more data sample through a cross-connect switch requires the steps of “reordering the data samples within one or more source nodes in accordance with the precomputed routing sequences” and “reordering the data samples within the destination nodes, whereby the data samples are transmitted during a correct time-slot.” Thus, in accordance with the present invention, the problem of routing samples in the cross-connect is reduced to one-to-one routing within each time-slot (see Specification; page 23, line 26, to page 24, line 2).

In contrast to the claimed invention, Carvey discloses a single TSI (111) corresponding to a given input data stream which “reorders the packets in input stream 201 so that all packets destined for the same output are consecutive and occupy a fixed time period on the reordered stream 202” (Carvey; column 3, lines 45-47). In an alternative embodiment shown in FIG. 3, Carvey discloses that the position of the optical switch 114 and TSI 11 can be reversed (Carvey; column 5, lines 56-58). In either embodiment, however, only a single TSI is used for each input stream, and therefore only one time slot reordering may be implemented per data stream. The scheme taught by Carvey cannot reasonable be analogized to the invention set forth in claims 1, 9, 16 and 23. Moreover, Flanagan does not supplement at least the above-noted deficiencies of Carvey, and therefore the cited prior art combination also fails to disclose the claimed invention.

The present invention is further distinguishable from the prior art of record in that the prior art fails to disclose a mesh architecture “comprising a plurality of nodes operatively interconnected with one another using one or more half-duplex links” as part of the synchronous cross-connect switch, as explicitly recited in claims 1, 16 and 23. A mesh architecture as set forth in the subject claims, which is not remotely analogous to the ring architecture taught by Flanagan, is intended to refer to an array of nodes, wherein each node is interconnected with respective adjacent nodes in the array using a plurality of half-duplex links (Specification; page 11, lines 14-16). The prior art references, when considered either individually or in combination, fails to teach or suggest a cross-connect switch including a mesh architecture, and/or a method of routing data samples through a cross-connect switch including a mesh architecture, configured in the claimed manner.

For at least the reasons set forth above, Applicant submits that independent claims 1, 9, 16 and 23 are patentable over the prior art of record. Accordingly, favorable reconsideration and allowance of claims 1, 9, 16 and 23 are respectfully solicited.

With regard to claims 2-8, which depend from claim 1, claims 10, 11 and 15, which depend from claim 9, claims 17-22, which depend from claim 16, and claims 24 and 25, which depend from claim 23, Applicant submits that these claims are also patentable over the prior art at least by virtue of their dependency from their respective base claims, which are believed to be patentable for at least the reasons set forth above. Moreover, one or more of these claims define additional patentable subject matter in their own right. For example, claims 2, 10 and 17 further require routing of the one or more data samples in a “substantially conflict-free manner.” The prior art of record, when considered either individually or in combination, fails to teach or suggest any mechanism for routing data in a substantially conflict-free manner. Although the Examiner contends that Carvey discloses such a feature (Office Action; page 4, paragraph 2), Applicant disagrees with this contention and invites the Examiner to point out with specificity where such disclosure exists.

Claims 8 and 22 further define the controller as including “at least one processor operative to: (i) precompute one or more routing sequences, the routing sequences reducing a routing in the mesh architecture to a one-to-one routing within each of one or more time-slots associated with the node; (ii) reorder the one or more data samples within one or more source nodes in accordance with the precomputed routing sequences; (iii) route the one or more data samples from the one or more source nodes to one or more corresponding destination nodes through the mesh; and (iv) reorder the one or more data samples within the destination nodes, whereby the data samples are transmitted during a correct time-slot.” The prior art fails to teach or suggest such additional features. With regard to claims 8 and 22, the Examiner contends that Carvey, in FIGS. 4 and 5, discloses precomputing one or more routing sequences, reordering the data samples within one or more time slots in accordance with the precomputed routing sequences, and routing the data samples from a source node to a destination node (Office Action; page 6, first paragraph). Applicant respectfully disagrees with this contention.

Claim 15 further defines the method of routing data samples set forth in claim 9 as including the step of “partitioning the one or more time-slots associated with the plurality of nodes into a

plurality of segments, each of the segments including a same number of nodes, each of the nodes including a subset of the one or more time-slots such that the one or more time-slots are distributed across the plurality of segments.” Applicant asserts that the prior art fails to teach or suggest this additional feature. With reference to claim 15, the Examiner contends that such a feature is taught by Carvey in FIGS. 4-7 (Office Action; page 8, last paragraph). Applicant respectfully disagrees with this contention and asserts that Carvey, in FIGS. 4-7, merely depicts “how the sequencer directs the switch to connect inputs to outputs during each of the four periods” (Carvey; column 3, lines 63-64). The only partitioning that is shown is in FIG. 6, but this partitioning is of the input stream (201) and reordered stream (202), and does not relate to partitioning the time-slots associated with the plurality of nodes in the mesh architecture into a plurality of segments, as required by claim 15.

For at least the reasons given above, Applicant submits that claims 2-8, 10, 11, 15, 17-22, 24 and 25 are believed to be patentable over the prior art of record, not merely by virtue of their dependence from their respective base claims, but also in their own right. Accordingly, favorable reconsideration and allowance of claims 2-8, 10, 11, 15, 17-22, 24 and 25 are respectfully requested.

Claim 12 stands rejected under §103(a) as being unpatentable over Carvey in view of Flanagan, and further in view of Zheng. Although Applicant respectfully disagrees that the combination of Carvey, Flanagan and Zheng discloses all of the features of claim 12, Applicants submit that claim 12, which depends from claim 9, is also patentable over the prior art at least by virtue of its dependency from claim 9, which is believed to be patentable for at least the reasons set forth above. Accordingly, favorable reconsideration and allowance of claim 12 are respectfully solicited.

Claim 14 stands rejected under §103(a) as being unpatentable over Carvey in view of Flanagan, and further in view of Carpinelli. While Applicant respectfully disagrees that the combination of Carvey, Flanagan and Carpinelli discloses all of the features of claim 14, Applicants submit that claim 14, which depends from claim 9, is also patentable over the prior art at least by virtue of its dependency from claim 9, which is believed to be patentable for at least the reasons set forth above. Accordingly, favorable reconsideration and allowance of claim 14 are respectfully requested.

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In view of the foregoing, Applicant believes that claims 1-25 are in condition for allowance, and respectfully requests withdrawal of the §112 and §103 rejections.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Wayne L. Ellenbogen", with a long horizontal flourish extending to the right.

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